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L8: Entry 1 of 6 File: DWPI Aug 6, 1996

DERWENT-ACC-NO: 1996-407277
DERWENT-WEEK: 199641

TITLE: Mfg. fibrous composite sheet - by supplying bundles of continuous monofilaments into fluid tank contg. resin powder, removing while pressing against horizontal bars, etc.

PATENT-ASSIGNEE:

ASSIGNEE	CODE
SEKISUI CHEM IND CO LTD	SEKI

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INT-CL (IPC): B29 C 70/06; B29 K 105:08

ABSTRACTED-PUB-NO: JP08197626A
BASIC-ABSTRACT:

Fibre bundles composed of many continuous monofilaments arranged in parallel are introduced in a fluid tank (7) filled by flowing resin powder (8) and pulled out from the tank while pressed against horizontal bars arranged vertically at required distances in the tank so as to open the fibre bundles while attaching the resin powder the open state fibre bundles with attached resin powder are joined together by a joining bar in the tank, the joined fibre bundles with attached resin powder are heated and formed in a sheet-shaped member by a heating unit placed at the outside of the tank, and a fibrous composite sheet is obtained by cooling and curing the sheet-shaped member by a cooling unit. Partition plates (15) are placed between the respective fibre bundles in the fluid tank so as to divide the inside of the tank to spaces (17) for passing the respective fibre bundles. Amount of resin powder attached to the respective fibre bundles are controlled by adjusting air quantity flowing through the respective spaces independently.

ADVANTAGE - A high strength wide sheet-shaped article with uniform thickness and uniformly arranged fibres is obtained continuously.

CHOSEN-DRAWING: Dwg.2/4

TITLE-TERMS: MANUFACTURE FIBRE COMPOSITE SHEET SUPPLY BUNDLE CONTINUOUS MONOFILAMENT FLUID TANK CONTAIN RESIN POWDER REMOVE PRESS HORIZONTAL BAR

DERWENT-CLASS: A32

CPI-CODES: A08-R01; A11-A02A; A11-A02C; A11-B09C; A11-C02; A12-S08A;

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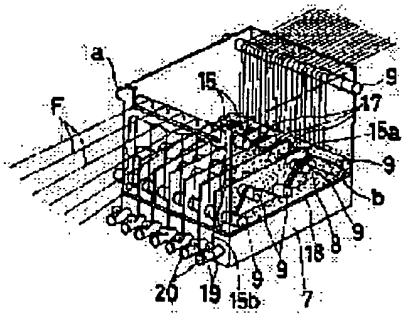
(71)Applicant : **SEKISUI CHEM CO LTD**
(72)Inventor : **KONISHI TAKAHIRO**
SUZUKI TOSHIYUKI

(54) MANUFACTURE OF FIBER COMPOSITE SHEET

(57)Abstract:
PURPOSE: To manufacture a wide fiber composite sheet having a thickness uniform in the cross direction, having no defective resin-impregnated part, and having excellent strength by a method wherein opening of fiber bundles in a fluid tank is performed uniformly and sufficiently, and attaching quantity of a resin powder to edges of both sides of each fiber bundle is increased.
CONSTITUTION: In a process for opening fiber bundles F consisting of a large number of continuous monofilaments and attaching resin powder, partition plates 15 are arranged among the fiber bundles F in a fluid tank 7. The inside of the tank 7 is divided into a plurality of spaces 17 through which the fiber bundles F pass. An air quantity in each partitioned space 17 in the fluid tank 7 is adjusted individually so as to adjust attaching quantity of resin powder 8 to the fiber bundles F in each space 17 reciprocally and individually. Thus, cutting removing parts at both side edges of a sheet are reduced so as to heighten manufacturing efficiency and sheets are continuously molded stably for a long time without entanglements of the fragments of the monofilaments with adjacent fiber bundles.



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2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The fiber bundle which consists of many continuation monofilaments is arranged in the shape of two or more parallel. While making each fiber bundle open when a necessary interval is drawn in the flow tub set and arranged up and down, and two or more level bars carry out the pressure welding of the above-mentioned fiber bundle to these level bars and make it for resin fine particles to flow and pass The process which makes resin fine particles adhere to each fiber bundle, and subsequently makes each resin fine-particles attachment-fibre bunch of a opening state join with the unification bar in this tub, Lead the resin fine-particles attachment-fibre bunch which joined to the heating unit besides a tub, and make with the shape of a sheet, and carry out heating fusion and cooling solidification is carried out [subsequently to the cooling section lead this sheet-like object, and]. In the process which includes the process which forms a fiber compound sheet and performs opening of the above-mentioned fiber bundle, and resin fine-particles adhesion By adjusting independently the air capacity in each space section into which the dashboard has been arranged among the fiber-bundle comrades in a flow tub, the inside of a tub was classified into two or more space sections which a fiber bundle passes, respectively, and the flow tub was classified The manufacture method of the fiber compound sheet characterized by adjusting independently the coating weight of the resin fine particles to the fiber bundle in each space section mutually.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the manufacture method of a fiber compound sheet.
[0002]
[Description of the Prior Art] As the manufacture method of the prepreg sheet used as a charge of reinforcing materials of the former, for example, plastics, and engineering plastics, and the fiber compound sheet which consists of fiber strengthening thermoplastics, such as a stumpable sheet Passing the fluid bed of thermoplastics fine particles and opening the fiber bundle which consists of many continuation monofilaments, sink in and heating fusion of the resin fine particles is carried out. The method (refer to JP,52-3985,B) of sheet-izing, and two or more fiber which became it tense in parallel and uniformly by passing the tub of resin fine particles A resin particle is made to adhere to fiber, and after removing a superfluous adhesion resin by giving vibration to fiber, the method (refer to JP,63-67446,B) of carrying out heating fusion and sheet-izing etc. is learned.
[0003] Fiber as shown in drawing 1 by these conventional methods (1) It consists of thermoplastics (2) and a width-of-face size is a fiber strengthening thermoplastics sheet (3) 100mm or more. When it creates, Within the tub to which resin fine particles are flowing, in the process which makes resin fine particles adhere to your being made to open a fiber bundle, in order to fully open and to make resin fine particles adhere, uniform in the shape of a monofilament and how to let the fiber bundle within the tub to which resin fine particles are flowing pass were important in the fiber bundle.
[0004]
[Problem(s) to be Solved by the Invention] However, according to the conventional method, since all of a majority of fiber bundles of a book were arranged in the shape of parallel and they were made to open in this path, prevention of the filamentation by contiguity fiber arose, and sufficient filamentation was not performed, but there was a problem that adhesion of resin fine particles was also inadequate and dispersion arose in the thick distribution of the sheet cross direction. On the other hand, although each fiber bundle will be opened in the shape of a monofilament and adhesion of resin fine particles will also become good if a large fiber-bundle interval is taken so that prevention of the filamentation by contiguity fiber may not arise The right-and-left edges-on-both-sides section of one opened fiber bundle is compared with a center section. Since there are few high density degrees of a filament, In the edges-on-both-sides section of a fiber bundle, there was little coating weight of resin fine particles, and the appearance of such a resin poor-wet portion had the problem that unevenness arises in the appearance of a sheet since it looks white, and intensity was inferior since thick dispersion of the sheet cross direction is also large.
[0005] For this reason, when fabricating of the sheet manufactured by the above-mentioned conventional method was carried out and a product was obtained, the sheet was torn, or the coefficient of linear expansion of the product fabricated in the forming cycle became uneven, and there was a problem that this product lenticulated by heat expansion and contraction.
[0006] Moreover, since thickness became thin, in order for there to have been little coating weight of the resin fine particles in the sheet edges-on-both-sides section, and to have obtained the sheet product which has predetermined thickness, cutting removal of the thick thin sheet edges-on-both-sides section needed to be carried out, and there was a problem that the cutting removal portion (KATTOSHIRO) increased, in a conventional method.
[0007] Furthermore, when you made it pass, carrying out the pressure welding of the fiber bundle to a bar within a flow tub and it opened, there was a problem that it was difficult to cut a monofilament, for the fragment of the monofilament which this produced to become entangled with an adjoining fiber bundle, to stabilize it for a long time, and to perform sheet fabrication by friction.
[0008] And it can fully open. the purpose of this invention is uniform in the fiber bundle which solves the problem of the above-mentioned conventional technology and consists of many continuation monofilaments -- Also in the edges-on-both-sides section of a fiber bundle, there is much coating weight of resin fine particles, therefore thickness is uniform crosswise. The broad sheet-like mold goods which do not have a resin poor-wet portion and were excellent in intensity can be manufactured. And it is in offering the manufacture method of a fiber compound sheet that there are few cutting removal portions of the sheet edges-on-both-sides section, and it does not become entangled with the fiber bundle which the fragment of a monofilament adjoins further, it is stabilized for a long time, and sheet fabrication can be performed.
[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention the fiber bundle which consists of many continuation monofilaments While making each fiber bundle open when a necessary interval is drawn in the flow tub set and arranged up and down, and two or more level bars carry out the pressure welding of the above-mentioned fiber bundle to

these level bars and make it to arrange in the shape of two or more parallel, and for resin fine particles to flow, and pass The process which makes resin fine particles adhere to each fiber bundle, and subsequently makes each resin fine-particles attachment-fibre bunch of a opening state join with the unification bar in this tub, Lead the resin fine-particles attachment-fibre bunch which joined to the heating unit besides a tub, and make with the shape of a sheet, and carry out heating fusion and cooling solidification is carried out [subsequently to the cooling section lead this sheet-like object, and]. In the process which includes the process which forms a fiber compound sheet and performs opening of the above-mentioned fiber bundle, and resin fine-particles adhesion By adjusting independently the air capacity in each space section into which the dashboard has been arranged among the fiber-bundle comrades in a flow tub, the inside of a tub was classified into two or more space sections which a fiber bundle passes, respectively, and the flow tub was classified It is characterized by adjusting independently the coating weight of the resin fine particles to the fiber bundle in each space section mutually.

[0010] In the above, as a fiber bundle (roving), a glass fiber, a carbon fiber, a ceramic fiber, poly flax id fiber, a polyester fiber, etc. must be raised, and the softening temperature must be higher than the melting point of thermoplastics.

[0011] Here, the intensity is lost at the time of heating melting as the softening temperature of a fiber bundle is under a melting point of thermoplastics.

[0012] Moreover, it is suitable for especially the diameter of the monofilament of a fiber bundle that it is [1-50-micrometer] 2-30 micrometers. The intensity to which the diameter of a monofilament can bear the tension produced in the taking over and amplitude to a heating melting process in less than 1 micrometer is not obtained, and the intensity as a fiber compound sheet is hard to be obtained here. By flow of resin fine particles, if the diameter of a monofilament becomes large exceeding 50 micrometers, since it is hard to open, it will become easy to produce the resin poor-wet section, and the intensity as a fiber compound sheet will not be obtained.

[0013] Moreover, although an optimum value changes with diameters of a filament of fiber, 400gf-3000gf is suitable for the tension of a fiber bundle. Here, in less than 400 gves, if it is hard to open a fiber bundle and a tension is large exceeding 3000gf(s), since fiber cannot bear the tension produced in the taking over to a heating melting process, the tension of a fiber bundle is not desirable.

[0014] In addition, since a tension makes each fiber bundle open uniformly, it is [being identically applied to all fiber bundles] desirable.

[0015] By the way, although sizing agents, such as polyvinyl acetate, starch, and polyester, are usually used in order to gather a filament, in order to make the unification with a filament and thermoplastics uniformly, filamentation of a filament needs to be performed easily, therefore use of a sizing agent has the good more nearly little one, and about 0.1 - 5% of the weight of a sizing agent is usually used to a filament.

[0016] Moreover, as thermoplastics which constitutes the resin fine particles of a flow tub, engineering plastics, such as olefin system polymers, such as polyethylene and polypropylene, a polyvinyl chloride resin and its copolymer, a polyether ape phon, and polyphenylene sulfide, the mixed resin of these thermoplastics and thermosetting resin, etc. are raised.

[0017] As for the particle diameter of resin fine particles, it is desirable that it is about 10-300 micrometers here, and if the particle diameter of resin fine particles exceeds less than 10 micrometers and a particle diameter exceeds 300 micrometers, since a resin will not adhere to the opened monofilament good, it is not desirable.

[0018] Below, the manufacture method of the fiber compound sheet by this invention is explained with reference to a drawing.

[0019] In addition, in the following explanation, a front shall say the move direction of a fiber bundle, i.e., the right of drawing 3 .

[0020] It sets to drawing 2 first and is a flow tub (7). Bottoms are gases (G) which consist of perforated plates (18) and have been sent from a gas supply way, such as air and nitrogen. It can blow off from the lower part of a perforated plate (18) up through many holes of this, and is closed. Consequently, flow tub (7) Fine-particles-like thermoplastics filled inside (8) Jet gas (G) It will be in a fluidization state and the fluid bed will be formed.

[0021] For example, as shown in drawing 4 , it is a flow tub (7). In back, it is a fiber bundle (F). Delivery machine (5) It is arranged and is a flow tub (7). Delivery machine (5) It is a flow tub (7) in between. Two guide bars (6) It is arranged. Flow tub (7) Ahead, the heating roller (11), the cooling roller (12), the taking over roll (13), and the reel (14) are arranged afterwards one by one.

[0022] drawing 2 -- setting -- flow tub (7) the inner posterior part upper part -- introduction side guide bar (a) it arranges -- having -- the above-mentioned delivery machine (5) from -- two or more fiber bundles (F) which it let out Introduction side guide bar (a) You set, for example, it is made to arrange in the shape of parallel at equal intervals.

[0023] And it sets to this invention and they are these fiber bundles (F). Flow tub (7) It hits leading to inside and is a tub (7). It sets inside and is each fiber bundle (F). Between comrades and this tub (7) Dashboards (15) are regular intervals crosswise at the right-and-left edges-on-both-sides section. the height direction -- tub (7) from a base up to a position higher than the fiber-bundle passage height best side -- the direction of a line -- tub by the side of fiber-bundle introduction (7) An internal surface to unification section bar (b) up to -- respectively -- installing -- each tub (7) inside -- respectively -- fiber bundle (F) It is classified into the passing space section (17). By this, it is each fiber bundle (F). Opening width of face is kept constant and they are resin fine particles (8). Coating weight becomes equal. Moreover, the monofilament cut by installing a dashboard (15) is a contiguity fiber bundle (F). Without twining, it is stabilized for a long time and continuous molding of a sheet becomes possible.

[0024] flow tub (7) inside -- introduction side guide bar (a) almost -- right under -- tub (7) a near bottom -- the 1st tension bar (9) the before ** -- a little -- the upper part -- the 2nd tension bar (9) the front of this -- the 1st tension bar (9) this level -- the 3rd tension bar (9) It is made to be located, respectively. The 3rd tension bar (9) It is the 2nd tension bar (9) in the front. It is each

resin fine-particles attachment-fibre bunch (F) of a opening state to this level. Joining unification section guide bar (b) It is made to be located and is a tub (7) further. It is the 4th tension bar (9) near the front wall. It is made to be located. The 1st - the 4th tension bar (9) And unification section guide bar (b) Each exists in the fluid bed. Flow tub (7) It is the 4th tension bar (9) at anterior part. It is a guide bar (9) to a heating roller (11) to an upper part position mostly. It is arranged. In addition, introduction side guide bar (a) Each fiber bundle which can be set (F) And unification section guide bar (b) In order to make it run each fiber which can be set stably, it is made as [receive / tension / these].

[0025] a dashboard (15) -- tub (7) the case where it installs inside -- as the installation method -- tub (7) Tension bar (9) currently constructed across horizontally inside it doubled -- inserting -- a hole -- a dashboard (15) -- preparing -- tension bar (9) It is desirable to attach between dashboards (15), as a crevice is not generated.

[0026] Furthermore, the setting position of the direction of a line of a dashboard (15) is a fiber bundle (F). As for an introduction side, it is desirable that it is in contact with the wall of a flow tub (7), and a taking over side is a unification section bar (b). Tension bar currently installed in 1 fiber-bundle introduction side from this (9) It is set up in between and is a unification section bar (b). It is desirable that it is in contact.

[0027] Moreover, flow tub (7) Fiber bundle [in / each space section (17) / by adjusting independently the air capacity in each classified space section (17)] (F) Resin fine particles (8) It is made as / adjust / independently / mutually / coating weight].

[0028] In this case, so that the upwash wind speed from the base of the fiber-bundle passage space section (17) between each dashboard (15) can be adjusted Flow tub (7) It also sets in the lower part at the bottom, and is an up dashboard (15a). Lower dashboard to extend (15b) [whether it prepares and] Or tub (7) Inner up dashboard (15a) It is a lower dashboard (15b) to this crosswise position. It prepares separately and is a flow tub (7). It is desirable to classify the space section below a base similarly. In order to enable it to adjust the upwash air capacity of the fiber-bundle passage space section (17) between each dashboard (15), it is a lower dashboard (15b). It sets in the direction of a line and is a tub (7). It is desirable to be installed from an induction internal surface to an outlet side wall surface.

[0029] And flow tub (7) The pipe for wind entrainments (20) to which the valve (19) was attached, respectively is connected, usually, the valve (19) opens in a part of space section divided in under surface than a base, and the degree of a bundle performs air-capacity adjustment of the fiber-bundle passage space section (17) between each dashboard (15) to it.

[0030] In addition, in case a glass filament is contacted, it is desirable, although thermoplastics, such as a polyvinyl chloride resin (PVC), polypropylene resin (PP), and polycarbonate resin (PC), thermosetting resin and metals, etc. are mentioned and it is not especially limited as the quality of the material of a dashboard (15) to use what has coefficient of friction small if possible so that cutting of a filament may not arise.

[0031] Moreover, the thickness of a dashboard (15) is 2mm or less preferably 10mm or less. When the thickness of a dashboard (15) is thick exceeding 10mm, it is each fiber bundle (F). In case it joins, it is a fiber bundle (F). Since a crevice is generated in between, the resin poor-wet section arises and the intensity of the sheet obtained falls, it is not desirable.

[0032] The arrangement interval of a dashboard (15) is a fiber bundle (F) to be used. It is set with the yarn count (weight per unit length), and the amount of fiber eyes of a product (weight per unit area).

[0033] By making upwash air capacity near the edges-on-both-sides section higher than a center section, and making the flow state of resin fine particles active at this time It becomes possible to double the resin fine-particles coating weight near the sheet edges-on-both-sides section at the time of heating roller introduction with a center section. Since dispersion with thick sheet width of face is canceled also in the sheet edges-on-both-sides section, and there is little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section and it ends, manufacture efficiency can be gathered.

[0034] flow tub (7) Introduction side guide bar (a) from -- unification section guide bar (b) up to -- each fiber bundle (F) as shown in drawing 2 , the same path is altogether sufficient as a path -- as it carries out or is shown in drawing 3 again, two or more groups are constituted every predetermined number -- making -- fiber bundle (F) of the same group all -- the same tension bar (9) You may make it make it pass.

[0035] That is, it sets to drawing 3 and is a flow tub (7). Two sets are arranged approximately. Each flow tub (7) In the inner posterior part upper part, it is a guide bar for introduction (a). It is arranged.

[0036] Fiber bundle which it let out from the delivery machine (F) The 1st flow tub (7) Introduction side guide bar (a) Although it set and has stood in a line in the shape of parallel, this is divided into 2 sets, the 1st set (FA) and the 2nd set (FB), and it is a flow tub (7). It introduces. Therefore, introduction side guide bar (a) It is a tub (7) right under mostly. Near the bottom, ****** 1 tension bar (9A) for the 1st set (FA) ****** 1 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. ** before ****** 1 tension bar for the 2nd set (FB) (9B) -- ****** 2 tension bar for the 1st set (FA) (9A) up a little ****** 2 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. In the slanting lower part near the ****** 2 tension bar for the 2nd set (FB) (9B), ****** 3 tension bar for the 1st set (FA) (9A) ****** 3 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. Unification guide bar which joins the front bottom of ****** 3 tension bar for the 2nd set (FB) (9B) in the 1st set (FA) and the 2nd set (FB) (b) It is made to be located. Furthermore, it is a unification guide bar (b). It is made for a common tension bar (9) to be located near the front wall of a tub (7) by the anterior. The 1st flow tub (7) Tension bar common to anterior part (9) It is the 2nd flow tub (7) to an upper part position mostly. Introduction side guide bar (a) Guide bar (9) It is arranged.

[0037] Next, it is the 2nd flow tub (7). Composition is the above-mentioned 1st flow tub (7). Since it was the same as that of composition almost, in this drawing, the same sign was given to the same thing. Tension bar common to the front part of the 2nd

flow tub (7) in addition (9) In an upper part position, it is a guide bar (9) to a heating roller mostly. It is arranged.
[0038] moreover, the 2nd flow tub (7) setting -- each fiber bundle (F) making vibration give fiber, after making it join -- tub (7) each inner bar -- the resin fine-particles grinding **** effect of fiber -- improving -- and fiber bundle (F) filamentation -- resin fine particles (8) adhesion promotes -- having . Moreover, by adjusting the size of vibration, vibration is given by adding a blow to a grain direction and a perpendicular direction with a squeeze bar (10) so that the sheet which has desired thickness may be obtained. About this point, it mentions later.
[0039] By the way, each fiber bundle (F) When making two or more groups constitute a path every predetermined number, 2 or more sets of how many sets are sufficient as the number of groups, and the number of groups is the fiber bundle (F) of ****. Fiber bundle in a number and tub induction (F) It is determined by an interval and the fiber opening width of face to set up.
[0040] 1 is all fiber bundles (F) in the number of groups. It is passing the same bar.
[0041] Moreover, tub (7) Inner unification section bar (b) All fiber bundles (F) By the time it makes it join, it is each fiber bundle (F). Tub (7) The number of paths which passes an inner bar, and the number of groups are in agreement, Furthermore, it cannot be overemphasized that every predetermined number is [every other / (drawing 3)] if it is / one / fewer than the number of the numbers of groups, i.e., 2 sets, and it is every two if it is 3 sets etc.
[0042] Moreover, fiber bundle from which a group is different (F) Flow tub (7) May pass another bar altogether from induction to the unification section, and tub (7) Bar (a) which touches the beginning of induction from -- several bars ****** -- all fiber bundles (F) the same bar -- through and it or subsequent ones -- unification section bar (b) up to -- a group may be made and a separate bar may be made to let pass and open between
[0043] moreover, tub (7) Inner unification section bar (b) by -- fiber bundle (F) of each class Passing tub (7) With [the number of an inside bar] one [or more], how many are sufficient as it.
[0044] Moreover, fiber bundle of each class (F) Passing flow tub (7) As for the lowest point position, it is desirable that it is the same or identically near height.
[0045] All fiber bundles (F) Bar made to join (b) A position is a tub (7). Although it will not matter if it is inside, it is desirable to be set as a position lower than the resin fine-particles flow side upper surface. Only a part with a thick dashboard (15) is a unification section bar (b). In order to have to make it have to open henceforth and to have to lose a crevice, when the position of a bar is set as the position higher than the resin fine-particles flow upper surface, they are resin fine particles (8) to the opened portion. It will be hard to make it adhere, thickness will become thin, and it will become what is easy to bend. However, if the thickness of a board (15) is 2mm or less, especially this point will not be restricted.
[0046] Moreover, it is each fiber bundle (F) by making it press with several bars, by the time it leads to a heating roller, after making it join, and doing so. Each fiber bundle open and according to a dashboard (15) (F) Since the crevice between between is filled and thickness becomes uniform, it is desirable.
[0047] moreover -- above -- each fiber bundle (F) making vibration give fiber, after making it join -- flow tub (7) the resin fine-particles grinding **** effect which is fiber in each inner bar -- improving -- fiber bundle (F) Filamentation and resin fine particles (8) Adhesion promotes. Moreover, the sheet which has desired thickness is obtained by adjusting the size of vibration.
[0048] There is the method of failing to write with the above-mentioned squeeze bar (10) etc. physically as a method of giving vibration to fiber, and it is carried out by making it arrange to a grain direction and a perpendicular direction, and adding a blow.
[0049] Although adjustment of the vibrational state of fiber with a squeeze bar (10) is performed by the vibration amplitude and the number of times of a blow and especially the limit does not exist, an effect is not discovered, unless it enlarges the number of times of a blow, when a vibration amplitude is small. Therefore, the amount of 1-20mm [of vibration amplitudes] and 100 - 2000 number-of-times/of a blow is suitable. In addition, there is no numerical limit of an oscillating grant position.
[0050] Fiber bundle (F) Adhering resin fine particles (8) As a method of heating, sources of general-purpose heating, such as a heating roller, hot blast, and far infrared rays, can be used. Heating temperature is resin fine particles (8). It is suitably chosen by a kind, the use use of a fiber compound sheet, etc. Moreover, as a forming means of a sheet-like melting resin sinking-in fiber bundle, a fiber compound sheet is suitably taken over continuously for a pressurization process and a cooling process by the taking over roll after a heating process which is prepared simultaneously and installed in the last section.
[0051]
[Function] According to the manufacture method of the fiber compound sheet by this invention, the fiber bundle which consists of many continuation monofilaments is arranged in the shape of parallel at equal intervals crosswise [two or more]. In the process which leads in the flow tub to which resin fine particles are flowing, and performs fine-particles adhesion with the filamentation of a fiber bundle A diaphragm is arranged between each fiber bundle and if needed in the right-and-left edges-on-both-sides section of a flow tub. Opening width of face of the fiber bundle in each space section into which it classified into two or more space sections in which a fiber bundle passes through the inside of a tub, respectively, and the flow tub was classified is fixed. The fiber distribution of the sheet cross direction and a thick distribution are uniform by making the upwash wind speed of the space section between the dashboards in near the right-and-left edges-on-both-sides section of a flow tub higher than the upwash wind speed of the space section between the dashboards in this tub center section. And a fiber compound sheet with high flexural strength can be manufactured.
[0052] Moreover, without the fragment of the monofilament produced in case the pressure welding of the fiber bundle is carried out to a bar and it is opened, since the diaphragm is arranged between each fiber bundle in the flow tub getting twisted around an adjoining fiber bundle, it is stabilized for a long time and continuous molding of a sheet becomes possible.
[0053]

[Example] Below, the example of this invention is explained in detail based on a drawing.
[0054] Polyvinyl chloride resin (PVC) sheet strengthened with the glass fiber using the equipment shown in drawing 4 according to the method of example 1 this invention (S) It created.
[0055] It is a glass fiber bunch (F) as strengthening fiber. It used 28 (the product made from Japanese **** Co., 23 micrometers of diameters of glass roving lot number #4400:fiber, the bunch of 4000 monofilaments, fiber-bundle size of about 10mm) a total of 56 at a time. These fiber bundles (F) Delivery machine (5) It sends out and they are two guide bars (6), respectively. It is the flow tub (7) of two upper and lower sides, making it go. Fluid bed introduction side guide bar (a) It arranged at 40mm equal interval in the longitudinal direction.
[0056] each flow tub (7) **** -- two or more bars (9) an interval is set and is constructed across horizontally up and down -- having -- **** -- resin fine particles (8) It is flowing. Here, they are resin fine particles (8). If carried out, what mixed vinyl chloride resin (the Shin-etsu chemistry company make, tradename MA800S, 100 micrometers of mean particle diameters) by the super mixer with stabilizer 2.0phr and lubricant 0.5phr was used.
[0057] Moreover, each flow tub (7) Inside, crosswise 29 dashboards (15) and (the product made from board thickness 2 mm:PVC) by 38mm regular intervals in the height direction tub (7) from a base up to a position higher 20mm than the fiber-bundle passage height best side -- the direction of a line -- tub by the side of fiber-bundle introduction (7) An internal surface to unification section bar (b) up to -- respectively -- installing -- each tub (7) inside -- respectively -- fiber bundle (F) It classified into the 28 passing space sections (17).
[0058] Moreover, flow tub (7) Fiber bundle [in / each space section (17) / by adjusting independently the air capacity in each classified space section (17)] (F) The coating weight of resin fine particles was mutually adjusted independently.
[0059] In addition, each flow tub (7) The upwash air capacity from a base is this tub (7). The right-and-left edges-on-both-sides section to the three fiber-bundle passage space sections (17) were 0.15m3 / second, 0.12m3 / second, and 0.1m3 / second one by one from the outside, respectively, and the fiber-bundle passage space sections for remaining 22 center sections (17) were 0.05m3 / second altogether.
[0060] It is a fiber bundle (F) to the space section (17) between these dashboard (15) comrades. It is a tension bar (9) at this path altogether 28 [per / every]. While carrying out a pressure welding, making it pass and opening in the shape of a monofilament Resin fine particles (8) While making it adhere to each monofilament, after catching between monofilaments, Each fiber bundle (F) One common unification guide bar (b) It leads. Each opened fiber bundle (F) The crevice between comrades is lost and it is a unification section bar (b). All fiber bundles (F) After joining and making it flat-tapped, it is a tension bar (9) further. It goes. After adjusting resin fine-particles coating weight by (part for a squeeze bar (10) and amplitude [of 10mm], and 1100 times/), Vertical flow tub (7) Glass fabrics (16), and (the product made from Japanese **** Co. and tradename WKA2015 D-VC1) were put between two resin fine-particles adhesion fiber taken over, and the laminating was carried out to three layers.
[0061] Subsequently, resin sinking-in fiber bundle which led the laminated material to the 220-degree C heating roller (11), and was opened by this (F) Heating fusion is carried out, it makes with the shape of a sheet, subsequently cooling solidification of this is carried out by the cooling roller (12), and it is a fiber compound sheet (S). It obtained and rolled round to the reel (14) through the ******** roll (13).
[0062] In addition, fiber compound sheet (S) Forming speed was a part for about 4.0m/, and the forming width-of-face size of this sheet (S) was 1050mm.
[0063] Example 2 flow tub (7) About the upwash air capacity from a base, it is a flow tub (7). The three fiber-bundle passage space sections (17) were the same as the example 1 from the right-and-left edges-on-both-sides section except having made it 0.1m3 / second, respectively, and the forming width-of-face size was 1050mm.
[0064] The fiber compound sheet was obtained like the example 2 except having not used example 3 glass fabrics (16).
[0065] It sets to the equipment used in the above-mentioned example 1, and the example of comparison of example ** of comparison is a flow tub (7). It was the same as the example 1 except having removed the inner dashboard (15) and having manufactured the fiber compound sheet, and the forming width-of-face size of a sheet was 1050mm.
[0066] The thick distribution (maximum, the minimum value, valve flow coefficient value) of the cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section and the sheet cross direction, the fiber valve flow coefficient value, and the flexural strength value were measured and evaluated about the sample of the fiber compound sheet obtained in examples 1-3 and the example of comparison. In addition, valve flow coefficient value means standard deviation/average.
[0067] The evaluation test was performed as follows.
[0068] 1. A thick setup made into the measurement target of the cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section is 0.4-0.65mm, and was expressed with the sum total of right and left of the width-of-face size of the cutting removal portion especially set to 0.4mm or less in the right-and-left edges-on-both-sides section of a sheet.
[0069] 2. Crosswise thickness was measured for the thick distribution measurement above-mentioned sample at intervals of 10mm using a micrometer, and maximum, the minimum value, and dispersion were computed with valve flow coefficient value.
[0070] 3. The fiber distribution measurement above-mentioned sample was cut for 20mm around, combustion separation of the pitch was carried out with the electric furnace, the weight of only a glass fiber was measured, and dispersion in crosswise was computed with valve flow coefficient value.
[0071] 4. The five-sheet laminating of the flexural strength measurement above-mentioned sample was carried out, it carried out press forming, using the autograph, the three-point bending test was performed and the flexural strength of a fiber perpendicular

direction was measured.

[0072] 5. Perform continuous running on stability evaluation each conditions for 24 hours, and it is a tub (7). The inner filament twined and the evaluation result of generating frequency was collectively shown in Table 1.

[0073]

[Table 1]

	カットシロ幅	肉厚			繊維CV値	曲げ強度値	安定性
		最大値	最小値	CV値			評価結果
実施例1	15mm	0.63mm	0.38mm	5.0%	5.0 %	4.0kg/cm^2	発生なし
実施例2	20mm	0.63mm	0.35mm	5.5%	5.3 %	4.8kg/cm^2	発生なし
実施例3	20mm	0.30mm	0.12mm	5.8%	5.3 %	--	発生なし
比較例1	80mm	0.65mm	0.17mm	10.0%	8.5 %	3.6kg/cm^2	10回発生

In the example 1 - the example 3, compared with the example of comparison, there was little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section, and it was that in which the thick distribution of the sheet cross direction has high flexural strength in an example 1 and the example 2 uniformly so that clearly from the result of the above-mentioned table 1. Moreover, flow tub (7) There was ten generating round which generating frequency does not have generating round which a filament twines in an example 1 - the example 3 by an inner filament twining, on the other hand a filament twines in the example 1 of comparison, and stability was bad.

[0074]

[Effect of the Invention] As mentioned above, according to the method of this invention, also in the edges-on-both-sides section of a fiber bundle, uniform and the broad sheet-like mold goods which it becomes uniform [a thick distribution and fiber distribution] crosswise [mold goods] mostly [the coating weight of resin fine particles] therefore, do not have a resin poor-wet portion, and were excellent in intensity can be manufactured for the fiber bundle which consists of many continuation monofilaments by the ability fully opening. And there is little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section, and it can gather manufacture efficiency. The effect that it does not become entangled with the fiber bundle which the fragment of a monofilament furthermore adjoins, it is stabilized for a long time, and continuous molding of a sheet can be performed is done so.

[0075] therefore, lenticulating [there is no tear of a sheet in a forming cycle, and / the coefficient of linear expansion of the fabricated product is uniform, and / a product]-by heat expansion and contraction ****** when carrying out fabricating of the fiber compound sheet manufactured by the method of this invention and obtaining a product -- the mold goods of the quality which does not have things, either and was excellent are obtained

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[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Industrial Application] this invention relates to the manufacture method of a fiber compound sheet.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art] As the manufacture method of the prepreg sheet used as a charge of reinforcing materials of the former, for example, plastics, and engineering plastics, and the fiber compound sheet which consists of fiber strengthening thermoplastics, such as a stumpable sheet Passing the fluid bed of thermoplastics fine particles and opening the fiber bundle which consists of many continuation monofilaments, sink in and heating fusion of the resin fine particles is carried out. The method (refer to JP,52-3985,B) of sheet-izing, and two or more fiber which became it tense in parallel and uniformly by passing the tub of resin fine particles A resin particle is made to adhere to fiber, and after removing a superfluous adhesion resin by giving vibration to fiber, the method (refer to JP,63-67446,B) of carrying out heating fusion and sheet-izing etc. is learned.
[0003] Fiber as shown in drawing 1 by these conventional methods (1) It consists of thermoplastics (2) and a width-of-face size is a fiber strengthening thermoplastics sheet (3) 100mm or more. When it creates, Within the tub to which resin fine particles are flowing, in the process which makes resin fine particles adhere to your being made to open a fiber bundle, in order to fully open and to make resin fine particles adhere, uniform in the shape of a monofilament and how to let the fiber bundle within the tub to which resin fine particles are flowing pass were important in the fiber bundle.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to the method of this invention, also in the edges-on-both-sides section of a fiber bundle, uniform and the broad sheet-like mold goods which it becomes uniform [a thick distribution and fiber distribution] crosswise [mold goods] mostly [the coating weight of resin fine particles] therefore, do not have a resin poor-wet portion, and were excellent in intensity can be manufactured for the fiber bundle which consists of many continuation monofilaments by the ability fully opening. And there is little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section, and it can gather manufacture efficiency. The effect that it does not become entangled with the fiber bundle which the fragment of a monofilament furthermore adjoins, it is stabilized for a long time, and continuous molding of a sheet can be performed is done so.
[0075] therefore, lenticulating [there is no tear of a sheet in a forming cycle, and / the coefficient of linear expansion of the fabricated product is uniform, and / a product]-by heat expansion and contraction ****** when carrying out fabricating of the fiber compound sheet manufactured by the method of this invention and obtaining a product -- the mold goods of the quality which does not have things, either and was excellent are obtained

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[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, according to the conventional method, since all of a majority of fiber bundles of a book were arranged in the shape of parallel and they were made to open in this path, prevention of the filamentation by contiguity fiber arose, and sufficient filamentation was not performed, but there was a problem that adhesion of resin fine particles was also inadequate and dispersion arose in the thick distribution of the sheet cross direction. On the other hand, although each fiber bundle will be opened in the shape of a monofilament and adhesion of resin fine particles will also become good if a large fiber-bundle interval is taken so that prevention of the filamentation by contiguity fiber may not arise The right-and-left edges-on-both-sides section of one opened fiber bundle is compared with a center section. Since there are few high density degrees of a filament, In the edges-on-both-sides section of a fiber bundle, there was little coating weight of resin fine particles, and the appearance of such a resin poor-wet portion had the problem that unevenness arises in the appearance of a sheet since it looks white, and intensity was inferior since thick dispersion of the sheet cross direction is also large.

[0005] For this reason, when fabricating of the sheet manufactured by the above-mentioned conventional method was carried out and a product was obtained, the sheet was torn, or the coefficient of linear expansion of the product fabricated in the forming cycle became uneven, and there was a problem that this product lenticulated by heat expansion and contraction.

[0006] Moreover, since thickness became thin, in order for there to have been little coating weight of the resin fine particles in the sheet edges-on-both-sides section, and to have obtained the sheet product which has predetermined thickness, cutting removal of the thick thin sheet edges-on-both-sides section needed to be carried out, and there was a problem that the cutting removal portion (KATTOSHIRO) increased, in a conventional method.

[0007] Furthermore, when you made it pass, carrying out the pressure welding of the fiber bundle to a bar within a flow tub and it opened, there was a problem that it was difficult to cut a monofilament, for the fragment of the monofilament which this produced to become entangled with an adjoining fiber bundle, to stabilize it for a long time, and to perform sheet fabrication by friction.

[0008] And it can fully open. the purpose of this invention is uniform in the fiber bundle which solves the problem of the above-mentioned conventional technology and consists of many continuation monofilaments -- Also in the edges-on-both-sides section of a fiber bundle, there is much coating weight of resin fine particles, therefore thickness is uniform crosswise. The broad sheet-like mold goods which do not have a resin poor-wet portion and were excellent in intensity can be manufactured. And it is in offering the manufacture method of a fiber compound sheet that there are few cutting removal portions of the sheet edges-on-both-sides section, and it does not become entangled with the fiber bundle which the fragment of a monofilament adjoins further, it is stabilized for a long time, and sheet fabrication can be performed.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention the fiber bundle which consists of many continuation monofilaments While making each fiber bundle open when a necessary interval is drawn in the flow tub set and arranged up and down, and two or more level bars carry out the pressure welding of the above-mentioned fiber bundle to these level bars and make it to arrange in the shape of two or more parallel, and for resin fine particles to flow, and pass The process which makes resin fine particles adhere to each fiber bundle, and subsequently makes each resin fine-particles attachment-fibre bunch of a opening state join with the unification bar in this tub, Lead the resin fine-particles attachment-fibre bunch which joined to the heating unit besides a tub, and make with the shape of a sheet, and carry out heating fusion and cooling solidification is carried out [subsequently to the cooling section lead this sheet-like object, and]. In the process which includes the process which forms a fiber compound sheet and performs opening of the above-mentioned fiber bundle, and resin fine-particles adhesion By adjusting independently the air capacity in each space section into which the dashboard has been arranged among the fiber-bundle comrades in a flow tub, the inside of a tub was classified into two or more space sections which a fiber bundle passes, respectively, and the flow tub was classified It is characterized by adjusting independently the coating weight of the resin fine particles to the fiber bundle in each space section mutually.

[0010] In the above, as a fiber bundle (roving), a glass fiber, a carbon fiber, a ceramic fiber, poly flax id fiber, a polyester fiber, etc. must be raised, and the softening temperature must be higher than the melting point of thermoplastics.

[0011] Here, the intensity is lost at the time of heating melting as the softening temperature of a fiber bundle is under a melting point of thermoplastics.

[0012] Moreover, it is suitable for especially the diameter of the monofilament of a fiber bundle that it is [1-50-micrometer] 2-30 micrometers. The intensity to which the diameter of a monofilament can bear the tension produced in the taking over and amplitude to a heating melting process in less than 1 micrometer is not obtained, and the intensity as a fiber compound sheet is hard to be obtained here. By flow of resin fine particles, if the diameter of a monofilament becomes large exceeding 50 micrometers, since it is hard to open, it will become easy to produce the resin poor-wet section, and the intensity as a fiber compound sheet will not be obtained.

[0013] Moreover, although an optimum value changes with diameters of a filament of fiber, 400gf-3000gf is suitable for the tension of a fiber bundle. Here, in less than 400 gves, if it is hard to open a fiber bundle and a tension is large exceeding 3000gf(s), since fiber cannot bear the tension produced in the taking over to a heating melting process, the tension of a fiber bundle is not desirable.

[0014] In addition, since a tension makes each fiber bundle open uniformly, it is [being identically applied to all fiber bundles] desirable.

[0015] By the way, although sizing agents, such as polyvinyl acetate, starch, and polyester, are usually used in order to gather a filament, in order to make the unification with a filament and thermoplastics uniformly, filamentation of a filament needs to be performed easily, therefore use of a sizing agent has the good more nearly little one, and about 0.1 - 5% of the weight of a sizing agent is usually used to a filament.

[0016] Moreover, as thermoplastics which constitutes the resin fine particles of a flow tub, engineering plastics, such as olefin system polymers, such as polyethylene and polypropylene, a polyvinyl chloride resin and its copolymer, a polyether ape phon, and polyphenylene sulfide, the mixed resin of these thermoplastics and thermosetting resin, etc. are raised.

[0017] As for the particle diameter of resin fine particles, it is desirable that it is about 10-300 micrometers here, and if the particle diameter of resin fine particles exceeds less than 10 micrometers and a particle diameter exceeds 300 micrometers, since a resin will not adhere to the opened monofilament good, it is not desirable.

[0018] Below, the manufacture method of the fiber compound sheet by this invention is explained with reference to a drawing.

[0019] In addition, in the following explanation, a front shall say the move direction of a fiber bundle, i.e., the right of drawing 3 .

[0020] It sets to drawing 2 first and is a flow tub (7). Bottoms are gases (G) which consist of perforated plates (18) and have been sent from a gas supply way, such as air and nitrogen. It can blow off from the lower part of a perforated plate (18) up through many holes of this, and is closed. Consequently, flow tub (7) Fine-particles-like thermoplastics filled inside (8) Jet gas (G) It will be in a fluidization state and the fluid bed will be formed.

[0021] For example, as shown in drawing 4 , it is a flow tub (7). In back, it is a fiber bundle (F). Delivery machine (5) It is arranged and is a flow tub (7). Delivery machine (5) It is a flow tub (7) in between. Two guide bars (6) It is arranged. Flow tub (7) Ahead, the heating roller (11), the cooling roller (12), the taking over roll (13), and the reel (14) are arranged afterwards one

by one.
[0022] drawing 2 -- setting -- flow tub (7) the inner posterior part upper part -- introduction side guide bar (a) it arranges -- having -- the above-mentioned delivery machine (5) from -- two or more fiber bundles (F) which it let out Introduction side guide bar (a) You set, for example, it is made to arrange in the shape of parallel at equal intervals.
[0023] And it sets to this invention and they are these fiber bundles (F). Flow tub (7) It hits leading to inside and is a tub (7). It sets inside and is each fiber bundle (F). Between comrades and this tub (7) Dashboards (15) are regular intervals crosswise at the right-and-left edges-on-both-sides section. the height direction -- tub (7) from a base up to a position higher than the fiber-bundle passage height best side -- the direction of a line -- tub by the side of fiber-bundle introduction (7) An internal surface to unification section bar (b) up to -- respectively -- installing -- each tub (7) inside -- respectively -- fiber bundle (F) It is classified into the passing space section (17). By this, it is each fiber bundle (F). Opening width of face is kept constant and they are resin fine particles (8). Coating weight becomes equal. Moreover, the monofilament cut by installing a dashboard (15) is a contiguity fiber bundle (F). Without twining, it is stabilized for a long time and continuous molding of a sheet becomes possible.
[0024] flow tub (7) inside -- introduction side guide bar (a) almost -- right under -- tub (7) a near bottom -- the 1st tension bar (9) the before ** -- a little -- the upper part -- the 2nd tension bar (9) the front of this -- the 1st tension bar (9) this level -- the 3rd tension bar (9) It is made to be located, respectively. The 3rd tension bar (9) It is the 2nd tension bar (9) in the front. It is each resin fine-particles attachment-fibre bunch (F) of a opening state to this level. Joining unification section guide bar (b) It is made to be located and is a tub (7) further. It is the 4th tension bar (9) near the front wall. It is made to be located. The 1st - the 4th tension bar (9) And unification section guide bar (b) Each exists in the fluid bed. Flow tub (7) It is the 4th tension bar (9) at anterior part. It is a guide bar (9) to a heating roller (11) to an upper part position mostly. It is arranged. In addition, introduction side guide bar (a) Each fiber bundle which can be set (F) And unification section guide bar (b) In order to make it run each fiber which can be set stably, it is made as [receive / tension / these].
[0025] a dashboard (15) -- tub (7) the case where it installs inside -- as the installation method -- tub (7) Tension bar (9) currently constructed across horizontally inside it doubled -- inserting -- a hole -- a dashboard (15) -- preparing -- tension bar (9) It is desirable to attach between dashboards (15), as a crevice is not generated.
[0026] Furthermore, the setting position of the direction of a line of a dashboard (15) is a fiber bundle (F). As for an introduction side, it is desirable that it is in contact with the wall of a flow tub (7), and a taking over side is a unification section bar (b). Tension bar currently installed in 1 fiber-bundle introduction side from this (9) It is set up in between and is a unification section bar (b). It is desirable that it is in contact.
[0027] Moreover, flow tub (7) Fiber bundle [in / each space section (17) / by adjusting independently the air capacity in each classified space section (17)] (F) Resin fine particles (8) It is made as / adjust / independently / mutually / coating weight].
[0028] In this case, so that the upwash wind speed from the base of the fiber-bundle passage space section (17) between each dashboard (15) can be adjusted Flow tub (7) It also sets in the lower part at the bottom, and is an up dashboard (15a). Lower dashboard to extend (15b) [whether it prepares and] Or tub (7) Inner up dashboard (15a) It is a lower dashboard (15b) to this crosswise position. It prepares separately and is a flow tub (7). It is desirable to classify the space section below a base similarly. In order to enable it to adjust the upwash air capacity of the fiber-bundle passage space section (17) between each dashboard (15), it is a lower dashboard (15b). It sets in the direction of a line and is a tub (7). It is desirable to be installed from an induction internal surface to an outlet side wall surface.
[0029] And flow tub (7) The pipe for wind entrainments (20) to which the valve (19) was attached, respectively is connected, usually, the valve (19) opens in a part of space section divided in under surface than a base, and the degree of a bundle performs air-capacity adjustment of the fiber-bundle passage space section (17) between each dashboard (15) to it.
[0030] In addition, in case a glass filament is contacted, it is desirable, although thermoplastics, such as a polyvinyl chloride resin (PVC), polypropylene resin (PP), and polycarbonate resin (PC), thermosetting resin and metals, etc. are mentioned and it is not especially limited as the quality of the material of a dashboard (15) to use what has coefficient of friction small if possible so that cutting of a filament may not arise.
[0031] Moreover, the thickness of a dashboard (15) is 2mm or less preferably 10mm or less. When the thickness of a dashboard (15) is thick exceeding 10mm, it is each fiber bundle (F). In case it joins, it is a fiber bundle (F). Since a crevice is generated in between, the resin poor-wet section arises and the intensity of the sheet obtained falls, it is not desirable.
[0032] The arrangement interval of a dashboard (15) is a fiber bundle (F) to be used. It is set with the yarn count (weight per unit length), and the amount of fiber eyes of a product (weight per unit area).
[0033] By making upwash air capacity near the edges-on-both-sides section higher than a center section, and making the flow state of resin fine particles active at this time It becomes possible to double the resin fine-particles coating weight near the sheet edges-on-both-sides section at the time of heating roller introduction with a center section. Since dispersion with thick sheet width of face is canceled also in the sheet edges-on-both-sides section, and there is little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section and it ends, manufacture efficiency can be gathered.
[0034] flow tub (7) Introduction side guide bar (a) from -- unification section guide bar (b) up to -- each fiber bundle (F) as shown in drawing 2 , the same path is altogether sufficient as a path -- as it carries out or is shown in drawing 3 again, two or more groups are constituted every predetermined number -- making -- fiber bundle (F) of the same group all -- the same tension bar (9) You may make it make it pass.
[0035] That is, it sets to drawing 3 and is a flow tub (7). Two sets are arranged approximately. Each flow tub (7) In the inner posterior part upper part, it is a guide bar for introduction (a). It is arranged.

[0036] Fiber bundle which it let out from the delivery machine (F) The 1st flow tub (7) Introduction side guide bar (a) Although it set and has stood in a line in the shape of parallel, this is divided into 2 sets, the 1st set (FA) and the 2nd set (FB), and it is a flow tub (7). It introduces. Therefore, introduction side guide bar (a) It is a tub (7) right under mostly. Near the bottom, ****** 1 tension bar (9A) for the 1st set (FA) ****** 1 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. ** before ****** 1 tension bar for the 2nd set (FB) (9B) -- ****** 2 tension bar for the 1st set (FA) (9A) up a little ****** 2 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. In the slanting lower part near the ****** 2 tension bar for the 2nd set (FB) (9B), ****** 3 tension bar for the 1st set (FA) (9A) ****** 3 tension bar for the 2nd set (FB) (9B) is made to be located a little [the], respectively by the front simultaneously said level. Unification guide bar which joins the front bottom of ****** 3 tension bar for the 2nd set (FB) (9B) in the 1st set (FA) and the 2nd set (FB) (b) It is made to be located. Furthermore, it is a unification guide bar (b). It is made for a common tension bar (9) to be located near the front wall of a tub (7) by the anterior. The 1st flow tub (7) Tension bar common to anterior part (9) It is the 2nd flow tub (7) to an upper part position mostly. Introduction side guide bar (a) Guide bar (9) It is arranged.

[0037] Next, it is the 2nd flow tub (7). Composition is the above-mentioned 1st flow tub (7). Since it was the same as that of composition almost, in this drawing, the same sign was given to the same thing. Tension bar common to the anterior part of the 2nd flow tub (7) in addition (9) In an upper part position, it is a guide bar (9) to a heating roller mostly. It is arranged.

[0038] moreover, the 2nd flow tub (7) setting -- each fiber bundle (F) making vibration give fiber, after making it join -- tub (7) each inner bar -- the resin fine-particles grinding **** effect of fiber -- improving -- and fiber bundle (F) filamentation -- resin fine particles (8) adhesion promotes -- having . Moreover, by adjusting the size of vibration, vibration is given by adding a blow to a grain direction and a perpendicular direction with a squeeze bar (10) so that the sheet which has desired thickness may be obtained. About this point, it mentions later.

[0039] By the way, each fiber bundle (F) When making two or more groups constitute a path every predetermined number, 2 or more sets of how many sets are sufficient as the number of groups, and the number of groups is the fiber bundle (F) of ****. Fiber bundle in a number and tub induction (F) It is determined by an interval and the fiber opening width of face to set up.

[0040] 1 is all fiber bundles (F) in the number of groups. It is passing the same bar.

[0041] Moreover, tub (7) Inner unification section bar (b) All fiber bundles (F) By the time it makes it join, it is each fiber bundle (F). Tub (7) The number of paths which passes an inner bar, and the number of groups are in agreement, Furthermore, it cannot be overemphasized that every predetermined number is [every other / (drawing 3)] if it is / one / fewer than the number of the numbers of groups, i.e., 2 sets, and it is every two if it is 3 sets etc.

[0042] Moreover, fiber bundle from which a group is different (F) Flow tub (7) May pass another bar altogether from induction to the unification section, and tub (7) Bar (a) which touches the beginning of induction from -- several bars ****** -- all fiber bundles (F) the same bar -- through and it or subsequent ones -- unification section bar (b) up to -- a group may be made and a separate bar may be made to let pass and open between

[0043] moreover, tub (7) Inner unification section bar (b) by -- fiber bundle (F) of each class Passing tub (7) With [the number of an inside bar] one [or more], how many are sufficient as it.

[0044] Moreover, fiber bundle of each class (F) Passing flow tub (7) As for the lowest point position, it is desirable that it is the same or identically near height.

[0045] All fiber bundles (F) Bar made to join (b) A position is a tub (7). Although it will not matter if it is inside, being set as a low position is more desirable than the resin fine-particles flow side upper surface. Only a part with a thick dashboard (15) is a unification section bar (b). In order to have to make it have to open henceforth and to have to lose a crevice, when the position of a bar is set as the position higher than the resin fine-particles flow upper surface, they are resin fine particles (8) to the opened portion. It will be hard to make it adhere, thickness will become thin, and it will become what is easy to bend. However, if the thickness of a board (15) is 2mm or less, especially this point will not be restricted.

[0046] Moreover, it is each fiber bundle (F) by making it press with several bars, by the time it leads to a heating roller, after making it join, and doing so. Each fiber bundle open and according to a dashboard (15) (F) Since the crevice between between is filled and thickness becomes uniform, it is desirable.

[0047] moreover -- above -- each fiber bundle (F) making vibration give fiber, after making it join -- flow tub (7) the resin fine-particles grinding **** effect which is fiber in each inner bar -- improving -- fiber bundle (F) Filamentation and resin fine particles (8) Adhesion promotes. Moreover, the sheet which has desired thickness is obtained by adjusting the size of vibration.

[0048] There is the method of failing to write with the above-mentioned squeeze bar (10) etc. physically as a method of giving vibration to fiber, and it is carried out by making it arrange to a grain direction and a perpendicular direction, and adding a blow.

[0049] Although adjustment of the vibrational state of fiber with a squeeze bar (10) is performed by the vibration amplitude and the number of times of a blow and especially the limit does not exist, an effect is not discovered, unless it enlarges the number of times of a blow, when a vibration amplitude is small. Therefore, the amount of 1-20mm [of vibration amplitudes] and 100 - 2000 number-of-times/of a blow is suitable. In addition, there is no numerical limit of an oscillating grant position.

[0050] Fiber bundle (F) Adhering resin fine particles (8) As a method of heating, sources of general-purpose heating, such as a heating roller, hot blast, and far infrared rays, can be used. Heating temperature is resin fine particles (8). It is suitably chosen by a kind, the use use of a fiber compound sheet, etc. Moreover, as a forming means of a sheet-like melting resin sinking-in fiber bundle, a fiber compound sheet is suitably taken over continuously for a pressurization process and a cooling process by the taking over roll after a heating process which is prepared simultaneously and installed in the last section.

[Translation done.]

* NOTICES *

OPERATION

[Function] According to the manufacture method of the fiber compound sheet by this invention, the fiber bundle which consists of many continuation monofilaments is arranged in the shape of parallel at equal intervals crosswise [two or more]. In the process which leads in the flow tub to which resin fine particles are flowing, and performs fine-particles adhesion with the filamentation of a fiber bundle A diaphragm is arranged between each fiber bundle and if needed in the right-and-left edges-on-both-sides section of a flow tub. Opening width of face of the fiber bundle in each space section into which it classified into two or more space sections in which a fiber bundle passes through the inside of a tub, respectively, and the flow tub was classified is fixed. The fiber distribution of the sheet cross direction and a thick distribution are uniform by making the upwash wind speed of the space section between the dashboards in near the right-and-left edges-on-both-sides section of a flow tub higher than the upwash wind speed of the space section between the dashboards in this tub center section. And a fiber compound sheet with high flexural strength can be manufactured. It is.

[0052] Moreover, without the fragment of the monofilament produced in case the pressure welding of the fiber bundle is carried out to a bar and it is opened, since the diaphragm is arranged between each fiber bundle in the flow tub getting twisted around an adjoining fiber bundle, it is stabilized for a long time and continuous molding of a sheet becomes possible.

[Translation done.]

* NOTICES *

EXAMPLE

[Example] Below, the example of this invention is explained in detail based on a drawing.
[0054] Polyvinyl chloride resin (PVC) sheet strengthened with the glass fiber using the equipment shown in drawing 4 according to the method of example 1 this invention (S) It created.
[0055] It is a glass fiber bunch (F) as strengthening fiber. It used 28 (the product made from Japanese **** Co., 23 micrometers of diameters of glass roving lot number #4400:fiber, the bunch of 4000 monofilaments, fiber-bundle size of about 10mm) a total of 56 at a time. These fiber bundles (F) Delivery machine (5) It sends out and they are two guide bars (6), respectively. It is the flow tub (7) of two upper and lower sides, making it go. Fluid bed introduction side guide bar (a) It arranged at 40mm equal interval in the longitudinal direction.
[0056] each flow tub (7) **** -- two or more bars (9) an interval is set and is constructed across horizontally up and down -- having -- **** -- resin fine particles (8) It is flowing. Here, they are resin fine particles (8). If carried out, what mixed vinyl chloride resin (the Shin-etsu chemistry company make, tradename MA800S, 100 micrometers of mean particle diameters) by the super mixer with stabilizer 2.0phr and lubricant 0.5phr was used.
[0057] Moreover, each flow tub (7) Inside, crosswise 29 dashboards (15) and (the product made from board thickness 2 mm:PVC) by 38mm regular intervals in the height direction tub (7) from a base up to a position higher 20mm than the fiber-bundle passage height best side -- the direction of a line -- tub by the side of fiber-bundle introduction (7) An internal surface to unification section bar (b) up to -- respectively -- installing -- each tub (7) inside -- respectively -- fiber bundle (F) It classified into the 28 passing space sections (17).
[0058] Moreover, flow tub (7) Fiber bundle [in / each space section (17) / by adjusting independently the air capacity in each classified space section (17)] (F) The coating weight of resin fine particles was mutually adjusted independently.
[0059] In addition, each flow tub (7) The upwash air capacity from a base is this tub (7). The right-and-left edges-on-both-sides section to the three fiber-bundle passage space sections (17) were 0.15m3 / second, 0.12m3 / second, and 0.1m3 / second one by one from the outside, respectively, and the fiber-bundle passage space sections for remaining 22 center sections (17) were 0.05m3 / second altogether.
[0060] It is a fiber bundle (F) to the space section (17) between these dashboard (15) comrades. It is a tension bar (9) at this path altogether 28 [per / every]. While carrying out a pressure welding, making it pass and opening in the shape of a monofilament Resin fine particles (8) While making it adhere to each monofilament, after catching between monofilaments, Each fiber bundle (F) One common unification guide bar (b) It leads. Each opened fiber bundle (F) The crevice between comrades is lost and it is a unification section bar (b). All fiber bundles (F) After joining and making it flat-tapped, it is a tension bar (9) further. It goes. After adjusting resin fine-particles coating weight by (part for a squeeze bar (10) and amplitude [of 10mm], and 1100 times/), Vertical flow tub (7) Glass fabrics (16), and (the product made from Japanese **** Co. and tradename WKA2015 D-VC1) were put between two resin fine-particles attachment fibres taken over, and the laminating was carried out to three layers.
[0061] Subsequently, resin sinking-in fiber bundle which led the laminated material to the 220-degree C heating roller (11), and was opened by this (F) Heating fusion is carried out, it makes with the shape of a sheet, subsequently cooling solidification of this is carried out by the cooling roller (12), and it is a fiber compound sheet (S). It obtained and rolled round to the reel (14) through the ******** roll (13).
[0062] In addition, fiber compound sheet (S) Forming speed was a part for about 4.0m/, and the forming width-of-face size of this sheet (S) was 1050mm.
[0063] Example 2 flow tub (7) About the upwash air capacity from a base, it is a flow tub (7). The three fiber-bundle passage space sections (17) were the same as the example 1 from the right-and-left edges-on-both-sides section except having made it 0.1m3 / second, respectively, and the forming width-of-face size was 1050mm.
[0064] The fiber compound sheet was obtained like the example 2 except having not used example 3 glass fabrics (16).
[0065] It sets to the equipment used in the above-mentioned example 1, and the example of comparison of example ** of comparison is a flow tub (7). It was the same as the example 1 except having removed the inner dashboard (15) and having manufactured the fiber compound sheet, and the forming width-of-face size of a sheet was 1050mm.
[0066] The thick distribution (maximum, the minimum value, valve flow coefficient value) of the cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section and the sheet cross direction, the fiber valve flow coefficient value, and the flexural strength value were measured and evaluated about the sample of the fiber compound sheet obtained in examples 1-3 and the example of comparison. In addition, valve flow coefficient value means standard

deviation/average.
[0067] The evaluation test was performed as follows.
[0068] 1. A thick setup made into the measurement target of the cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section is 0.4-0.65mm, and was expressed with the sum total of right and left of the width-of-face size of the cutting removal portion especially set to 0.4mm or less in the right-and-left edges-on-both-sides section of a sheet.
[0069] 2. Crosswise thickness was measured for the thick distribution measurement above-mentioned sample at intervals of 10mm using a micrometer, and maximum, the minimum value, and dispersion were computed with valve flow coefficient value.
[0070] 3. The fiber distribution measurement above-mentioned sample was cut for 20mm around, combustion separation of the pitch was carried out with the electric furnace, the weight of only a glass fiber was measured, and dispersion in crosswise was computed with valve flow coefficient value.
[0071] 4. The five-sheet laminating of the flexural strength measurement above-mentioned sample was carried out, it carried out press forming, using the autograph, the three-point bending test was performed and the flexural strength of a fiber perpendicular direction was measured.
[0072] 5. Perform continuous running on stability evaluation each conditions for 24 hours, and it is a tub (7). The inner filament twined and the evaluation result of generating frequency was collectively shown in Table 1.
 [0073]
[Table 1]

	カットシロ幅	肉厚			繊維CV値	曲げ強度値	安定性
		最大値	最小値	CV値			評価結果
実施例1	15mm	0.63mm	0.38mm	5.0%	5.0 %	4.9kg/cm^2	発生なし
実施例2	20mm	0.63mm	0.35mm	5.5%	5.3 %	4.8kg/cm^2	発生なし
実施例3	20mm	0.30mm	0.12mm	5.6%	5.3 %	--	発生なし
比較例1	80mm	0.65mm	0.17mm	10.0%	8.5 %	3.6kg/cm^2	10回発生

In the example 1 - the example 3, compared with the example of comparison, there was little cutting removal partial (KATTOSHIRO) width of face of the sheet edges-on-both-sides section, and it was that in which the thick distribution of the sheet cross direction has high flexural strength in an example 1 and the example 2 uniformly so that clearly from the result of the above-mentioned table 1. Moreover, flow tub (7) There was ten generating round which generating frequency does not have generating round which a filament twines in an example 1 - the example 3 by an inner filament twining, on the other hand a filament twines in the example 1 of comparison, and stability was bad.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the important section expanded sectional view of a fiber compound sheet.
[Drawing 2] a part of manufacturing installation of the fiber compound sheet used for the method of this invention -- it is a notch perspective diagram
[Drawing 3] It is the outline vertical cross section showing one example now [of the manufacturing installation of the fiber compound sheet used for the method of this invention].
[Drawing 4] It is the outline vertical cross section of the whole manufacturing installation of the fiber compound sheet used for the example of this invention.
[Description of Notations]
F: Strengthening fiber
S: Fiber compound sheet
5: Fiber-bundle delivery machine
6: Guide bar
7: Flow tub
8: Resin fine particles
9: Tension bar
10: Squeeze bar
11: Heating roller
12: Cooling roller
13: Taking over roll
14: Reel
15: Dashboard
16: Glass fabrics
17: Fiber-bundle passage space section

[Translation done.]

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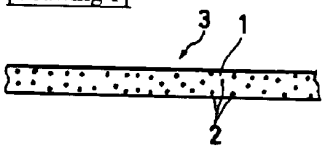
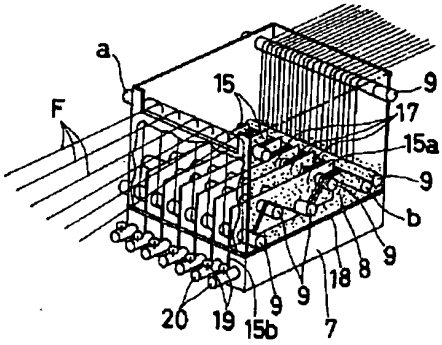
DRAWINGS

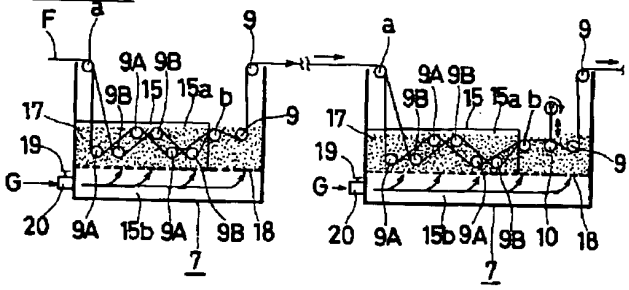
[Drawing 1]



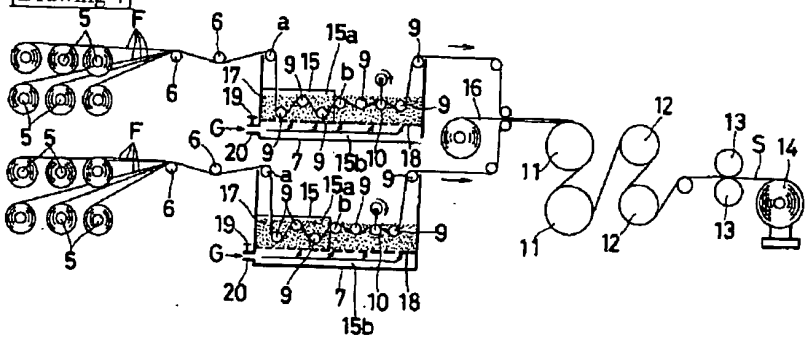
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]